# THE EFFECT OF SOIL MOISTURE AND pH ON WOODLOUSE POPULATIONS

BY KIM L.T. ONG, B.A.

## INTRODUCTION

It has been claimed (Sutton, 1972) that woodlice (Isopoda: Oniscoidea) are most numerous in calcareous and alkaline soils. Furthermore, it is well known that the behaviour of woodlice is strongly influenced by atmospheric humidity (Cloudsley-Thompson, 1977). It was therefore decided to test aspects of these points by means of field observations on *Armadillidium vulgare* (Latr.), *Porcellio scaber* Latr., *Oniscus asellus* L. and *Philoscia muscorum* (Scop.).

## METHODS

Since woodlice tend to aggregate in damp, dark, habitats – such as stones and crevices – the quadrat method was not appropriate for estimating population densities. Collections were made over periods of 30 minutes in 16 localities in southern England and Wales. Comparable sites were selected with regard to the amount of vegetation cover, trampling by animals and man, and other environmental factors. Woodlice were collected from beneath stones and logs, and sorted from standard samples of leaf litter. They were later returned to their sites. Counts were not made on walls or beneath the bark of trees, as the work considered solid moisture and pH. All collections were made during daytime between April and July, 1978, which included the breeding season, but only adults were recorded.

TABLE 1. – NUMBERS OF WOODLICE COLLECTED IN DIFFERENT LOCALITIES

| Locality | Soil Type | Water % | pH | Number of woodlice |
|---|---|---|---|---|
| N. Wales | Rich Mull | 77.0 | 5.8 | 74 |
| N. Wales | Rich Mull | 79.9 | 5.9 | 80 |
| S. Wales | Rich Mull | 78.8 | 7.7 | 196 |
| Godalming | Sandy | 28.1 | 6.0 | 70 |
| Coulsdon | Chalky | 24.0 | 7.4 | 54 |
| Purley | Chalky | 53.6 | 8.4 | 165 |
| Crystal Palace | Clay | 42.0 | 5.5 | 41 |
| Banstead Downs | Chalky | 21.5 | 7.2 | 32 |
| Farthing Downs | Chalky | 16.0 | 6.0 | 22 |
| Oakes Park, Banstead | Rich Mull | 18.5 | 6.0 | 50 |
| Purley | Rich Mull/Chalky | 48.1 | 7.4 | 229 |
| Cheltenham | Clay/Rich Mull | 31.0 | 5.7 | 95 |
| Broadway | Clay/Rich Mull | 29.2 | 7.4 | 142 |
| Woburn Sands | Sandy/Rich Mull | 40.5 | 5.3 | 11 |
| Swanley | Clay | 20.5 | 7.2 | 105 |
| Kirdford | Rich Mull/Clay | 28.0 | 8.8 | 95 |

From 4-6 samples were taken of the top 3 cm of soil (the level at which the woodlice were collected) placed in firmly corked specimen tubes, and subsequently analysed for pH and water content. The pH was measured with an accurate, direct reading pH meter and the means of the samples were recorded. Aliquots of about 4g were placed in foil containers of known weight, weighed to an accuracy of 0.01 g and dried to constant weight at 90° C to estimate the percentage water content.

## RESULTS

The soil pH, percentage water content, and total numbers of woodlice found are listed in Table 1; while the relationship between pH and numbers of woodlice of different species collected in 30 minutes is shown in fig. 1. The results do not indicate any correlation between soil moisture and the sizes of the woodlouse populations and this was confirmed by statistical analysis.

A highly significant correlation ($p > 0.1 : F = 9.2$) was however obtained between sample sizes and soil pH. In the block histograms (fig. 1), a peak is indicated at a soil pH between 7 and 8 in all four species. At present, it is not known whether this can be attributed to metabolic requirements for lime, the effect of pH on soil structure, or its indirect effects on the vegetation.

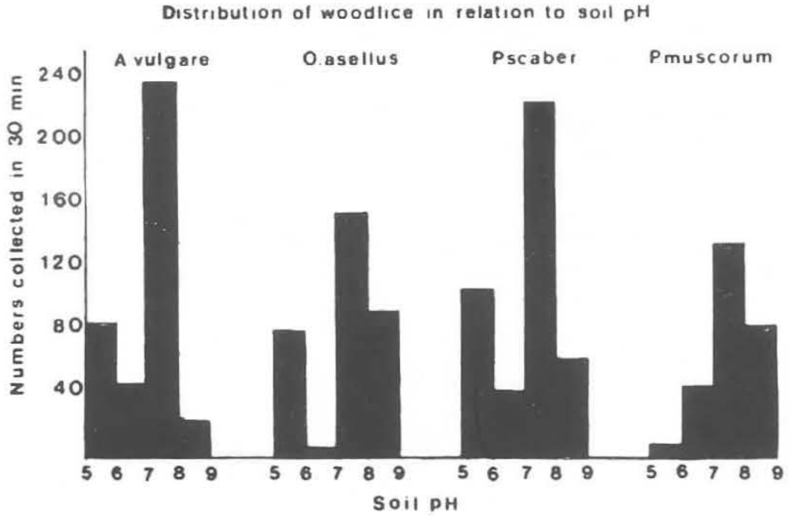

Fig. 1. – Distribution of woodlice in relation to soil pH.

## CONCLUSION

The results indicate that woodlouse populations are affected by soil pH, but not by moisture content. Numbers were particularly low in acid soil (pH below 6), and also in areas where there was excessive trampling, as on common land. *A. vulgare* tended to be most prevalent in drier microclimates. Previously, quantitative assessments of soil pH and animal populations have merely indicated much larger numbers of nematodes, earthworms, molluscs, and arthropods on base-rich than on acid soils (Cloudsley-Thompson & Sankey, 1953; 1956). Sutton's (1972) claim has therefore been verified by a quantitative survey of woodlouse distribution in relation to soil pH.

## REFERENCES

**Edney, E.B.**, 1954, Woodlice and the land habitat, *Biol. Rev.* **29:** 185-219. **Sutton, S.L.**, 1972, *Woodlice*, Ginn, London. **Thompson, J.L. Cloudsley-**, 1977, *The water and temperature relations of woodlice*, Meadowfield, Shildon, Co. Durham. **Thompson, J.L. Cloudsley- & Sankey, J.H.P.**, 1953, Some aspects of the fauna of the district around Juniper Hall, Mickleham, Surrey II, *Entomologist's mon. Mag.* **89:** 284-6; 1954, *Idem. III, Ibid,* **92:** 132-4.

14 Westminster Court, Osborne Gardens, Thornton Heath, Surrey, CR48 8PA.
*January* 19*th*, 1979.